

What is claimed is:

1. An optical signal processing apparatus comprising:  
at least one photodiode for converting an optical signal  
to an electrical signal; and

a resonant tunneling diode for having the electrical  
signal of this photodiode inputted thereto and performing  
switch operation;

wherein a digital signal is acquired by the switch  
operation of the resonant tunneling diode.

2. The optical signal processing apparatus as claimed  
in claim 1, comprising an optical modulator that changes its  
transmittance by the switch operation of the resonant tunneling  
diode and modulates and outputs light.

3. The optical signal processing apparatus as claimed  
in claim 1, wherein an electrical signal is acquired by the  
switch operation of the resonant tunneling diode.

4. An optical signal processing apparatus comprising:  
at least one photodiode for converting an optical signal  
to an electrical signal;

a resistor having its one end connected to an anode of  
this photodiode; and

a resonant tunneling diode having one end connected to  
the one end of this resistor;

wherein a digital signal is acquired by switch operation  
of the resonant tunneling diode.

5. The optical signal processing apparatus as claimed in claim 4, comprising an optical modulator connected to the one end of the resonant tunneling diode, changing its transmittance, and modulating and outputting light.

6. The optical signal processing apparatus as claimed in claim 4, wherein an electrical signal is acquired from the one end of the resonant tunneling diode.

7. An optical signal processing apparatus comprising:

at least one photodiode for converting an optical signal to an electrical signal;

a first resistor having its one end connected to an anode of this photodiode;

a resonant tunneling diode having its one end connected to the one end of this resistor; and

a second resistor having its one end connected to the other end of the resonant tunneling diode;

wherein a digital signal is acquired by switch operation of the resonant tunneling diode.

8. The optical signal processing apparatus as claimed in claim 7, comprising an optical modulator connected to the other end of the resonant tunneling diode, changing its transmittance, and modulating and outputting light.

9. The optical signal processing apparatus as claimed in claim 7, wherein an electrical signal is acquired from the other end of the resonant tunneling diode.

10. The optical signal processing apparatus as claimed in one of claims 1 to 9, wherein the photodiodes are provided at least in parallel.

11. The optical signal processing apparatus as claimed in one of claims 1 to 9, wherein the photodiodes are provided at least in series.

12. The optical signal processing apparatus as claimed in one of claims 1 to 9, wherein at least the photodiode and the resonant tunneling diode are formed on the same semiconductor substrate.

13. The optical signal processing apparatus as claimed in one of claims 2, 5 and 8, wherein at least the photodiode, the resonant tunneling diode and the optical modulator are formed on the same semiconductor substrate.